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Serial No. 10/747,818 Filed December 29, 2003

Applicant(s) Huynh et al.

Papers filed herewith on

- ☑ Fees $ 800 (check #091089)
- ☐ New-Formal Application
- ☑ Amendment (19 pages)
- ☐ Notice of Appeal
- ☐ Appeal Brief
- ☐ Assignment
- ☐ Proposed Drawing Correction
- ☐ Priority Document(s)
- ☐ Req. for Ext. of Time
- ☐ ______Sheets of ______Formal Drawings

DEC 2 1 2004

☑ Other First Supplemental Information Disclosure Statement (4 pages): Transmittal Letter (1 page): Copy of Cited Prior Art

Receipt is hereby acknowledged of the papers filed as indicated in connection with above identified case.

COMMISSIONER OF PATENTS AND TRADEMARKS

91082 OIPE SEP 21 2006 IAP28 PATENT & TRADEMARK OFFICE

REISSUE PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of U.S. Pat. No. 5,917,455)

Applicants:	Huynh and Mailandt	)
Serial No.:	10/747,818	)
Filed:	December 29, 2003	)
For:	Electrically Variable Beam Tilt Antenna	)

CERTIFICATE OF MAILING

I hereby certify that this paper is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450, on this date.

12-20-04
Date

Eric D. Cohen
Reg. No. 38,110

SECOND PRELIMINARY AMENDMENT FOR NON-BROADENING REISSUE APPLICATION

MAIL STOP REISSUE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

This communication is a second preliminary amendment for the above-identified reissue application. Please enter this preliminary amendment prior to consideration on the merits.

AMENDMENT TO THE SPECIFICATION:

Please amend the Abstract as follows:

> An antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface. The antenna assembly comprises a plurality of antennas in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antennas are disposed, and a phase adjustment mechanism electrically disposed between the first [second] and third antenna groups, such that adjustment of the phase adjustment mechanism results in variation of the vertical radiation pattern downtilt angle.

Please amend the 1st paragraph on Col. 4 of the specification as follows, which paragraph extends from line 1 through line 13:

> FIGS. 1 and 2 are side and front views, respectively, of an antenna assembly 100 in accordance with the present invention. The antenna assembly 100 comprises a plurality of antenna means such as antennas 101-105 arranged as first, second, and third antenna groups 115, 116, and 117. Antenna 101 alone forms the first antenna group 115, while antennas 102 and 103 form the second antenna group 116, and antennas 104 and 105 form the third antenna group 117. Phase adjustment means, such as a phase adjustment mechanism 108, is physically disposed between the second and third antenna groups 116, 117. Operation and effect of the phase adjustment mechanism 108 will be discussed in detail subsequently.

IN THE CLAIMS:

Please amend the claims as follows:

1. (twice amended) A base station array [An] antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antenna means in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antenna means are disposed;

differential phase adjustment means electrically disposed on a path of transmission line means between the first [second] and third antenna groups configured to simultaneously advance a phase angle of a signal to one of said first [second] and third antenna groups and delay the phase angle of said signal to the other of said first [second] and third antenna groups;

such that adjustment of the phase adjustment means results in variation of the vertical radiation pattern downtilt angle between a first fixed position and a second fixed position;

said differential phase adjustment means including coupling means arcuately moveable along an arcuate section of said transmission line means to cause said simultaneous advance of a phase angle of a signal to one of said first and third antenna groups and a delay of the phase angle of said signal to the other of said first and third antenna groups.

24. (twice amended) A base station array [An] antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antennas in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antennas are disposed;

a phase adjustment mechanism electrically disposed between the first [second] and third antenna groups, the phase adjustment mechanism including:

an input coupling element;

a movable coupling section having a pivotally mounted first end electromagnetically coupled to the input coupling element; and

a semicircular, air-substrated transmission line section electromagnetically coupled to a second end of the movable coupling section;

such that pivotal position adjustment of the phase adjustment mechanism results in variation of the vertical radiation pattern downtilt angle between a first fixed position and a second fixed position.

32. (twice amended) A base station array [An] antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antennas in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antennas are disposed;

a phase adjustment mechanism electrically disposed between the first [second] and third antenna groups, the phase adjustment mechanism including:

an input coupling element;

a movable coupling section having a pivotally mounted first end electromagnetically coupled to the input coupling element; and

a semicircular, air-substrated transmission line section electromagnetically coupled to a second end of the movable coupling section;

the phase adjustment mechanism having a range of adjustment including a minimum downtilt position, a mid-point, and a maximum downtilt position;

a drive mechanism coupled to the movable coupling section;

electrical path lengths at the operating frequency, from the input coupling element to each of the antennas, are selected to define a progressive phase shift between each of the antennas such that, with the phase adjustment mechanism set at its mid-point, the vertical radiation pattern downtilt angle is approximately 7 degrees;

such that adjustment of the phase adjustment mechanism results in variation of the vertical radiation pattern downtilt angle.

Please add new claims 34-49.

34. The antenna assembly of claim 1 wherein the coupling means is capacitively coupled to the transmission line means.

35. The antenna assembly of claim 1 wherein the coupling means includes a pivotally

mounted, electrically conductive section.

36. The antenna assembly of claim 1 further comprising drive means coupled to the coupling means.

37. The antenna assembly of claim 36 wherein the drive means comprises an electric motor.

38. The antenna assembly of claim 36 wherein the drive means receives control inputs from a remote location.

39. The antenna assembly of claim 38 wherein the drive means further includes means configured to transmit position information relating to the phase adjustment means to the remote location.

40. The antenna assembly of claim 39 wherein said means configured to transmit position information includes a position detector.

41. The antenna assembly of claim 40 wherein said position detector comprises a Hall effect sensor, an optical encoder, a synchro servo system or other position detection device.

42. The antenna assembly of claim 36 wherein said drive mechanism is a resolver, or servomotor, or stepping motor or other electric motor, or other positioning device.

43. The antenna assembly of claim 1 wherein at least one of said antenna groups includes in a feed comprising a dielectric-substrated microstrip transformer.

44. The antenna assembly of claim 1 wherein said arcuate section of said transmission line means comprises an air-substrated metal conductor.

45. The antenna assembly of claim 24 wherein the second end of the movable coupling section is capacitively coupled to the transmission line section.

46. The antenna assembly of claim 24 wherein at least one of said antenna groups includes in a feed comprising a dielectric-substrated microstrip transformer.

47. The antenna assembly of claim 25 wherein said drive mechanism comprises a resolver, or servomotor or stepping motor or other electric motor, or other positioning device.

48. The antenna assembly of claim 28 wherein the drive mechanism includes a position detector.

49. The antenna assembly of claim 48 wherein said position detector comprises a Hall effect sensor, an optical encoder, a synchro servo system or other position detection device.

REMARKS

Preliminary Remarks

This communication is a second preliminary amendment to the claims and specification, which is also made in view of prior art references, copies of which are attached along with an information disclosure statement. The amendments to the claims are believed to distinguish the claimed invention over the prior art references previously cited, and over the new prior art cited in an Information Disclosure Statement attached hereto. Applicant shall submit a supplemental oath upon and indication of allowable subject matter.

Applicant wishes to point out to the Examiner that applicant has filed a Request for Certificate of Correction on or about October 21, 2004 to clarify the above described text, but such Certificate has not yet issued.

This communication is also in response to a third party protest filed on September 22, 2004 by Michael J. Mehrman of Mehrman Law Office, Atlanta Georgia, presumably filed on behalf of EMS Technologies.

Examination of the subject reissue patent application in light of this second preliminary amendment and prior first preliminary amendment is respectfully requested prior to examination on the merits.

Remarks Regarding Claim Amendments And Support In The Specification

Support for changes to the abstract and paragraphs of the specification are found in the issued specification in Figs. 2 and 11, and at Col. 4, lines 1-14; and Col. 6, lines 43-54.

Support for changes to claims 1, 24, and 32 regarding the terms "physically," "electrically," "second antenna," "first antenna," and the newly added last clause of claim 1 are found in the issued

specification in Figs. 2 and 11, and at Col. 4, lines 1-14; and Col. 6, lines 43-54.

Support for new claims 35-36, 44, and 47 is found in the issued specification in Figs. 2 and 11; Col. 2, lines 59-67; Col. 4, lines 1-14 and 23-30; Col. 5, lines 35-41; and Col. 6, lines 43-54.

Support for new claims 37-38, 42-43, and 48 is found in the issued specification in Fig 14, and at Col. 2, lines 48-58; and Col. 7, lines 13-23.

Support for new claims 39-40 is found in the issued specification in Fig 14, and at Col. 2, lines 48-58; and Col. 7, lines 8-23.

Support for new claims 41, 49, and 50 is found in the issued specification in Fig 14, and at Col. 7, lines 23-27.

Support for new claims 44-46 is found in the issued specification in Figs. 11 and 14, and at Col. 2, lines 59-67; Col. 4, line 60 to Col. 5, line 3; and Col. 6, lines 5-13.

Additional support for amendment to the specification and claims is also presented in the Remarks section regarding the third party protest below.

Remarks Regarding Claim Amendments And Third Party Protest

Applicant submits that the reissue application does not broaden the scope of the claims for the reasons set forth below. Applicant's proposed reissue claim language changes the phrase "phase adjustment means disposed between the second and third antenna groups" to "differential phase adjustment means electrically disposed between the first and third antenna groups." Essentially, the term "second" antenna has been clarified to recite the term "first" antenna, to make it consistent with electrical description associated with the antenna groups disclosed in the specification, drawings, and arguments made by the applicant during prosecution of the original application. This change merely conforms the claims to the electrical description of the antenna groups set forth in the specification,

and is not a substantive change. The term "differential phase adjustment" means further distinguishes the claimed invention over various prior art references.

As a preliminary matter, it is very important to understand the context in the specification in which the phase shifter is described relative to the antenna groups. In that regard, the specification of the issued patent ("the '455 patent") discloses both a physical placement of the phase shifter 108 and an electrical placement of the phase shifter. The specification of the issued patent clearly discloses a first antenna group 115 formed by lone antenna 101, a second antenna group 116 formed by antennas 102 and 103, and a third antenna group 117 formed by antennas 104 and 105. (Col. 4, lines 1-9). However, the phase shifter 108 is physically disposed between the second antenna group 116 and the third antenna group 117, and is also electrically disposed between the first antenna group 115 and the third antenna group 117.

In the first instance, the position of the phase shifter is described in a physical sense relative to the other components. Figure 2 shows the phase shifter 108 physically disposed on the backplane between the second antenna group 116 and the third antenna group 117. This shows the physical layout of the phase shifter component on the metal backplane. Figure 11 also shows this. The specification discloses such a physical placement of the phase shifter between the second and third antenna groups at column 4, lines 7-14. This has been clarified in the subject second preliminary amendment by the proposed changes to the two paragraphs of the specification.

In the second instance, the position of the phase shifter is described in an electrical sense relative to the other components, which differs from the physical description. Electrically, the phase shifter is disposed or connected between the first antenna group 115 and the third antenna group 117, as clearly disclosed in the specification and in the figures, and in particular, Fig. 11. This has also

been clarified in the subject second preliminary amendment by the proposed changes to the two paragraphs of the specification. In that regard, the specification states that:

> The semicircular transmission line section 305... has first and second opposed end portions 306, 307 from which antenna feeder cables (1109, 1110 in Fig. 11) direct RF signals, having a desired phase relationship, to the <u>first and third</u> antenna groups 115, 117 of the antenna assembly 100. The <u>second antenna group</u> 116 is fed from a transformer 113... (Col. 5, lines 4-11, emphasis added).
>
> Moving the phase adjustment mechanism to its maximum downtilt position 1112 shortens the effective electrical path lengths from the phase adjustment mechanism input point 1103 to the <u>first antenna group 115</u>, while lengthening the paths to the antennas 104-105 of the <u>third antenna group 117</u>. Of course, since the <u>second antenna group is not fed through the phase adjustment mechanism</u>, the path length to the second antenna group does not change. (Col. 6, lines 42-51, emphasis added).

Both the physical and electrical placement of the phase shifter are simultaneously shown in Figs 2 and 11. The phase shifter is physically disposed between the second 116 and third 117 antenna groups on the backplane, as can be plainly seen in Fig. 2. Furthermore, it can be clearly seen in Fig. 2 that waveguides <u>electrically</u> coupling the phase shifter 108 to the respective antenna groups extend from opposite ends of the arcuately shaped phase shifter to the first and third antenna groups, respectively. This, in addition to Fig. 11, clearly show the electrical disposition of the phase shifter. Thus, both the physical and electrical disposition of the phase shifter are fully supported in the figures and the specification.

To summarize, the phase shifter 108 is disposed differently depending upon whether one is concerned with the physical layout or position of the phase shifter on the metal backplane, or whether one is concerned with the electrical coupling of the phase shifter to the antenna groups.

Original claim 1 recites:

> phase adjustment means disposed between the second and third antenna groups configured to simultaneously advance a phase angle of a signal to one of said second and third antenna groups and delay the phase angle of said signal to the other of said second and third antenna groups . . . results in variation of the vertical radiation pattern downtilt angle.

However, this can only make sense if the claim is referring to the electrical disposition of the phase shifter. Applicant has inadvertently used the language describing the physical disposition of the phase shifter relative to the antenna groups when reciting the electrical connection of the phase shifter to the antenna groups. Such mixing of the physical and electrical descriptions creates an inconsistency between the specification and the claims.

With respect to the specification and its prosecution history, the original claims prepared by the drafter mistakenly recited the phase adjustment means as being disposed between the second and third antenna groups. It is clear that the drafter mistakenly used the physical disposition of the phase shifter when describing the electrical disposition of the phase shifter. This was an easy mistake to make.

In fact, the Examiner correctly noted this mistake in a first office action dated March 19, 1998 where he stated in paragraph 2 of the office action that:

> The drawings are objected to because the figure 11 shows a phase adjustment means disposed between the first antenna group (one antenna means) and second antenna group instead of between the second and third antenna groups as that mentioned in the claim 1. Correction is required.

However, the Examiner's recommended corrective action would have made the drawings inconsistent with the specification. In response to the office action dated September 18, 1998, applicant indicated that the correction would be made in the claims rather than in the drawings, and indicated that "[a]s now amended, claim 1 and Figure 11 are consistent." However, the applicant

inadvertently failed to correct the claims as he indicate he would do. In the Remarks, the applicant correctly stated that:

> Claim 1 has been amended to more clearly distinguish the invention over the art of record and now calls for, among other things, a phase adjustment means disposed between the first and third antenna groups. The phase shifter of the present invention is configured to advance, <u>by a variable amount</u>, the phase angle of a signal to one of the first and third antenna groups while <u>simultaneously</u> delaying the phase angle of the signal to the other of the first and third antenna groups by an equal amount. (emphasis in original, Office Action response, 9/18/98, page 6)

The applicant made the correct argument with respect to the electrical connection of the phase shifter, and addressed the fact that the phase shifter is [electrically] disposed between the first and third antenna groups, as set forth in the specification, but as noted above, failed to amend the claims in conformity with the specification or his arguments. Neither the applicant nor the examiner noticed that the inconsistency had not been corrected, and a Notice of Allowability was issued on October 27, 1998, with the same language recited in the reasons for allowance. The subject reissue application clarifies this claim language.

Applicant is attempting to correct the claim language in accordance with the Examiner's and the applicant's intention so that the claims conform in pertinent part to the electrical description of the phase shifter disclosed in the specification. In that regard, applicant is merely clarifying what is already clear from the specification, and even a casual reading of the specification would lead one skilled in the art to understand exactly where the phase shifter was located electrically, namely between the first and third antenna groups, rather than between the second and third antenna groups, which describes the phase shifter's physical location on the backplane.

Similarly, in *Akron Brass Co. v. Elkhart Brass Manufacturing Co.*, 353 F.2d 704, 708 n.5 (7th

Cir. 1965), the reissue applicant substituted the word "outlet" for "inlet" in the claim. There, as here, because it was already clear what was meant, the Court held that the substitution of outlet" or "inlet" did not in any way enlarge or modify the substance of claim as it appeared in the original patent." Accordingly, applicant submits that the proposed reissue claims do not enlarge the scope of the original claims. Moreover, additional limitations have been added to the claim language, in particular, the independent claims.

Thus, the specification makes it crystal clear that the phase adjuster 305 is electrically coupled between the first 115 and third 117 antenna group, but physically disposed between the second 116 and third 117 antenna group. This is also correctly shown in the drawings, in particular, Figures 2 and 11. In *May v. Carriage, Inc.*, 688 F. Supp. 408, 415 (N.D. Ind. 1988), the court found that because the specification made it very clear what the terms meant, the deletion of the word "closely" from the phrase "closely adjacent" in the reissued claim did not enlarge the scope of the original claim. Similarly, applicant's invention is clearly defined in the specification and drawings, which leaves no doubt exactly where the phase shifter is located relative to the various antenna groups. Accordingly, applicant submits that the proposed reissue claims do not enlarge the scope of the original claims.

<u>Closing Remarks</u>

The Commissioner is hereby authorized to charge any additional fee which may be required for this application under 37 C.F.R. §§ 1.16-1.18, including but not limited to the issue fee, or credit any overpayment, to Deposit Account No. 23-0920. Should no proper amount be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit

Account No. 23-0920.

Respectfully submitted,

WELSH & KATZ, LTD.

By

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December 20, 2004

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CLEAN COPY OF ALL CLAIMS WITH CHANGES INCORPORATED

1. (twice amended) A base station array antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antenna means in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antenna means are disposed;

differential phase adjustment means electrically disposed on a path of transmission line means between the first and third antenna groups configured to simultaneously advance a phase angle of a signal to one of said first and third antenna groups and delay the phase angle of said signal to the other of said first and third antenna groups;

such that adjustment of the phase adjustment means results in variation of the vertical radiation pattern downtilt angle between a first fixed position and a second fixed position;

said differential phase adjustment means including coupling means arcuately moveable along an arcuate section of said transmission line means to cause said simultaneous advance of a phase angle of a signal to one of said first and third antenna groups and a delay of the phase angle of said signal to the other of said first and third antenna groups.

2. (original) The antenna assembly of claim 1, wherein the second and third antenna groups each comprise a plurality of antenna means.

3. (original) The antenna assembly of claim 2, wherein the first antenna group comprises one antenna means.

4. (original) The antenna assembly of claim 2, wherein the second and third antenna groups each comprises two antenna means.

5. (original) The antenna assembly of claim 2, wherein each of the antenna means comprises a log-periodic dipole array.

6. (original) The antenna assembly of claim 5, wherein each of the log-periodic dipole array antennas comprises generally complementary front and rear dipole sections wherein one arm of each dipole is provided by the front dipole section, and the opposing arm of each dipole is provided by the rear dipole section.

7. (original) The antenna assembly of claim 1, wherein the backplane is a plate of conductive material.

8. (original) The antenna assembly of claim 1, wherein the backplane is substantially perpendicular to the earth's surface.

9. (original) The antenna assembly of claim 1, wherein the phase adjustment means comprises:

input coupling means;

movable coupling means having a pivotally mounted first end electromagnetically coupled to the input coupling means; and

transmission line means electromagnetically coupled to a second end of the movable coupling means.

10. (original) The antenna assembly of claim 9, further comprising drive means coupled to the movable coupling element.

11. (original) The antenna assembly of claim 10, wherein the drive means comprises an electric motor.

12. (original) The antenna assembly of claim 10, wherein the drive means is operable from a remote location.

13. (original) The antenna assembly of claim 12, wherein the drive means further includes means for transmitting position information relating to the phase adjustment means to the remote location.

14. (original) The antenna assembly of claim 9, wherein the input coupling means comprises an input coupling element formed in a T-shape from a plate of conductive material, and the input coupling element is coupled to an antenna assembly cable.

15. (original) The antenna assembly of claim 9, wherein the transmission line means comprises a semicircular, air-substrated transmission line section having opposing ends coupled to antenna feeder cables.

16. (original) The antenna assembly of claim 15, wherein the antenna feeder cables are coupled to power dividers.

17. (original) The antenna assembly of claim 16, wherein each of the power dividers is a microstrip transformer fabricated on a substrate of relatively low-loss dielectric material.

18. (original) The antenna assembly of claim 16, further comprising a first power divider coupled to the input coupling element of the phase adjusting means and to a second power divider having a plurality of outputs, each output coupled to an antenna means of the second antenna group.

19. (original) The antenna assembly of claim 18, wherein:

the phase adjustment means has a range of adjustment including a minimum downtilt position, a mid-point, and a maximum downtilt position; and

electrical path lengths at the operating frequency, from the input coupling means to each of the antenna means, are selected to define a progressive phase shift between each of the antenna means such that, with the phase adjustment means set at its mid-point, the vertical radiation pattern downtilt angle is approximately 7 degrees.

20. (original) The antenna assembly of claim 19, wherein the vertical radiation pattern downtilt angle is approximately zero degrees with the phase adjustment means set at the minimum downtilt position.

21. (original) The antenna assembly of claim 19, wherein the vertical radiation pattern downtilt angle is approximately 14 degrees with the phase adjustment means set at the maximum downtilt position.

22. (once amended) The antenna assembly of claim 1, wherein said antenna assembly further comprises an input coupling means, said phase adjustment means providing a continuously variable electrical path length between said input coupling means and said first and third antenna groups.

23. (original) The antenna assembly of claim 22 wherein said phase adjustment means comprises transmission line means having first and second ends, and movable coupling means adjustably coupling the input coupling means to the transmission line means, whereby adjustment of said movable coupling means simultaneously decreases the electrical path length between said input coupling means and one of the first and second ends of said transmission line means and increases the electrical path length between the input coupling means and the other of said first and second ends of said transmission line means.

24. (twice amended) A base station array antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antennas in first, second, and third antenna groups physically disposed along a backplane, the backplane having a longitudinal axis along which the antennas are disposed;

a phase adjustment mechanism electrically disposed between the first and third antenna groups, the phase adjustment mechanism including:

an input coupling element;

a movable coupling section having a pivotally mounted first end electromagnetically

coupled to the input coupling element; and

a semicircular, air-substrated transmission line section electromagnetically coupled to a second end of the movable coupling section;

such that pivotal position adjustment of the phase adjustment mechanism results in variation of the vertical radiation pattern downtilt angle between a first fixed position and a second fixed position.

25. (original) The antenna assembly of claim 24, further comprising a drive mechanism coupled to the movable coupling element.

26. (original) The antenna assembly of claim 25, wherein the drive mechanism is an electric motor.

27. (original) The antenna assembly of claim 25, wherein the drive mechanism is operable from a remote location.

28. (original) The antenna assembly of claim 27, wherein the drive mechanism transmits position information relating to the phase adjustment mechanism to the remote location.

29. (original) The antenna assembly of claim 24, wherein:

the phase adjustment mechanism has a range of adjustment including a minimum downtilt position, a mid-point, and a maximum downtilt position; and

electrical path lengths at the operating frequency, from the input coupling element to each of the antennas, are selected to define a progressive phase shift between each of the antennas such that, with the phase adjustment mechanism set at its mid-point, the vertical radiation pattern downtilt angle is approximately 7 degrees.

30. (original) The antenna assembly of claim 29, wherein the vertical radiation pattern downtilt angle is approximately zero degrees with the phase adjustment mechanism set at the minimum downtilt position.

31. (original) The antenna assembly of claim 29, wherein the vertical radiation pattern downtilt angle is approximately 14 degrees with the phase adjustment mechanism set at the maximum downtilt position.

32. (twice amended) A base station array antenna assembly having an operating frequency and a vertical radiation pattern with a main lobe axis defining a downtilt angle with respect to the earth's surface, the antenna assembly comprising:

a plurality of antennas in first, second, and third antenna groups physically disposed along a

backplane, the backplane having a longitudinal axis along which the antennas are disposed;

a phase adjustment mechanism electrically disposed between the first and third antenna groups, the phase adjustment mechanism including:

an input coupling element;

a movable coupling section having a pivotally mounted first end electromagnetically coupled to the input coupling element; and

a semicircular, air-substrated transmission line section electromagnetically coupled to a second end of the movable coupling section;

the phase adjustment mechanism having a range of adjustment including a minimum downtilt position, a mid-point, and a maximum downtilt position;

a drive mechanism coupled to the movable coupling section;

electrical path lengths at the operating frequency, from the input coupling element to each of the antennas, are selected to define a progressive phase shift between each of the antennas such that, with the phase adjustment mechanism set at its mid-point, the vertical radiation pattern downtilt angle is approximately 7 degrees;

such that adjustment of the phase adjustment mechanism results in variation of the vertical radiation pattern downtilt angle.

33. (original) The antenna assembly of claim 32, wherein the drive mechanism comprises an electric motor drive capable of activation from a remote location, and transmitting position information relating to the phase adjustment mechanism to the remote location.

34. (new) The antenna assembly of claim 1 wherein the coupling means is capacitively coupled to the transmission line means.

35. (new) The antenna assembly of claim 1 wherein the coupling means includes a pivotally mounted, electrically conductive section.

36. (new) The antenna assembly of claim 1 further comprising drive means coupled to the coupling means.

37. (new) The antenna assembly of claim 36 wherein the drive means comprises an electric motor.

38. (new) The antenna assembly of claim 36 wherein the drive means receives control inputs

from a remote location.

39. (new) The antenna assembly of claim 38 wherein the drive means further includes means configured to transmit position information relating to the phase adjustment means to the remote location.

40. (new) The antenna assembly of claim 39 wherein said means configured to transmit position information includes a position detector.

41. (new) The antenna assembly of claim 40 wherein said position detector comprises a Hall effect sensor, an optical encoder, a synchro servo system or other position detection device.

42. (new) The antenna assembly of claim 36 wherein said drive mechanism is a resolver, or servomotor, or stepping motor or other electric motor, or other positioning device.

43. (new) The antenna assembly of claim 1 wherein at least one of said antenna groups includes in a feed comprising a dielectric-substrated microstrip transformer.

44. (new) The antenna assembly of claim 1 wherein said arcuate section of said transmission line means comprises an air-substrated metal conductor.

45. (new) The antenna assembly of claim 24 wherein the second end of the movable coupling section is capacitively coupled to the transmission line section.

46. (new) The antenna assembly of claim 24 wherein at least one of said antenna groups includes in a feed comprising a dielectric-substrated microstrip transformer.

47. (new) The antenna assembly of claim 25 wherein said drive mechanism comprises a resolver, or servomotor or stepping motor or other electric motor, or other positioning device.

48. (new) The antenna assembly of claim 28 wherein the drive mechanism includes a position detector.

49. (new) The antenna assembly of claim 48 wherein said position detector comprises a Hall effect sensor, an optical encoder, a synchro servo system or other position detection device.